U.S. Department
of Transportation

Federal Aviation Administration

Advisory Circular

Subject: Change 9 to AIRPORT DESIGN

Date: 9/26/2005 **AC No:** 150/5300-13
Initiated by: AAS-100 **Change:** 9

1. PURPOSE. This Change contains revisions to Table 3-3 and Appendix 2. A requirement to increase the width of the Runway Safety Area at higher altitudes, deleted by Change 6, was inadvertently reinserted in Table 3-3 in Change 8. Appendix 2 includes new standards for runway end siting requirements, including a new 40:1 departure surface.

2. CHANGED TEXT. Changed text is indicated by vertical bars in the margins.

PAGE CONTROL CHART

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David L. Bennett
Director, Airport Safety and Standards

Table 3-2. Runway design standards for aircraft approach categories A & B runways with lower than 3/4-statute mile (1 200 m) approach visibility minimums
(Refer also to Appendix 16 for the establishment of new approaches)

ITEM	DIM[1]	AIRPLANE DESIGN GROUP				
		I [2]	I	II	III	IV
Runway Length	A	- Refer to paragraph 301 -				
Runway Width	B	75 ft 23 m	100 ft 30 m	100 ft 30 m	100 ft 30 m	150 ft 45 m
Runway Shoulder Width		10 ft 3 m	10 ft 3 m	10 ft 3 m	20 ft 6 m	25 ft 7.5 m
Runway Blast Pad Width		95 ft 29 m	120 ft 36 m	120 ft 36 m	140 ft 42 m	200 ft 60 m
Runway Blast Pad length		60 ft 18 m	100 ft 30 m	150 ft 45 m	200 ft 60 m	200 ft 60 m
Runway Safety Area Width	C	300 ft 90 m	300 ft 90 m	300 ft 90 m	400 ft 120 m	500 ft 150 m
Runway Safety Area Length Prior to Landing Threshold		600 ft 180 m	600 ft 180 m	600 ft 180 m	600 ft 180 m	600 ft 180 m
Runway Safety Area Length Beyond RW End[3]	P	600 ft 180 m	600 ft 180 m	600 ft 180 m	800 ft 240 m	1,000 ft 300 m
Obstacle Free Zone Width and length		- Refer to paragraph 306 -				
Runway Object Free Area Width	Q	800 ft 240 m	800 ft 240 m	800 ft 240 m	800 ft 240 m	800 ft 240 m
Runway Object Free Area Length Beyond RW End[3]	R	600 ft 180 m	600 ft 180 m	600 ft 180 m	800 ft 240 m	1,000 ft 300 m

1/ Letters correspond to the dimensions on figures 2-1 and 2-3.

2/ These dimensional standards pertain to facilities for small airplanes exclusively.

3/ The runway safety area and runway object free area lengths begin at each runway end when stopway is not provided. When stopway is provided, these lengths begin at the stopway end. The runway safety area length and the object free area length are the same for each runway end. Use the table (3-1 or 3-2) that results in the longest dimension. RSA length beyond the runway end standards may be met by provision of an Engineered Materials Arresting System or other FAA approved arresting system providing the ability to stop the critical aircraft using the runway exiting the end of the runway at 70 knots. See AC 150/5220-22.

Table 3-3. Runway design standards for aircraft approach categories C & D
(Refer also to Appendix 16 for the establishment of new approaches)

ITEM	DIM[1]	AIRPLANE DESIGN GROUP					
		I	II	III	IV	V	VI
Runway Length	A	- Refer to paragraph 301 -					
Runway Width	B	100 ft 30 m	100 ft 30 m	100 ft 30 m	150 ft 45 m	150 ft 45 m	200 ft 60 m
Runway Shoulder Width[3]		10 ft 3 m	10 ft 3 m	20 ft 6 m	25 ft 7.5 m	35 ft 10.5 m	40 ft 12 m
Runway Blast Pad Width		120 ft 36 m	120 ft 36 m	140 ft 42 m	200 ft 60 m	220 ft 66 m	280 ft 84 m
Runway Blast Pad length		100 ft 30 m	150 ft 45 m	200 ft 60 m	200 ft 60 m	400 ft 120 m	400 ft 120 m
Runway Safety Area Width[4]	C	500 ft 150 m	500 ft 150 m	500 ft 150 m	500 ft 150 m	500 ft 150 m	500 ft 150 m
Runway Safety Area Length Prior to Landing Threshold		600 ft 180 m	600 ft 180 m	600 ft 180 m	600 ft 180 m	600 ft 180 m	600 ft 180 m
Runway Safety Area Length Beyond RW End[5]	P	1,000 ft 300 m	1,000 ft 300 m	1,000 ft 300 m	1,000 ft 300 m	1,000 ft 300 m	1,000 ft 300 m
Obstacle Free Zone Width and length		- Refer to paragraph 306 -					
Runway Object Free Area Width	Q	800 ft 240 m	800 ft 240 m	800 ft 240 m	800 ft 240 m	800 ft 240 m	800 ft 240 m
Runway Object Free Area Length Beyond RW End[5]	R	1000 ft 300 m	1000 ft 300 m	1000 ft 300 m	1000 ft 300 m	1,000 ft 300 m	1000 ft 300 m

1/ Letters correspond to the dimensions on figures 2-1 and 2-3.

2/ For Airplane Design Group III serving airplanes with maximum certificated takeoff weight greater than 150,000 pounds (68 100 kg), the standard runway width is 150 feet (45 m), the shoulder width is 25 feet (7.5 m), and the runway blast pad width is 200 feet (60 m).

3/ Design Groups V and VI normally require stabilized or paved shoulder surfaces.

4/ For Airport Reference Code C-I and C-II, a runway safety area width of 400 feet (120 m) is permissible.

5/ The runway safety area and runway object free area lengths begin at each runway end when stopway is not provided. When stopway is provided, these lengths begin at the stopway end. The runway safety area length and the object free area length are the same for each runway end. Use the table (3-1 or 3-2) that results in the longest dimension. RSA length beyond the runway end standards may be met by provision of an Engineered Materials Arresting System or other FAA approved arresting system providing the ability to stop the critical aircraft using the runway exiting the end of the runway at 70 knots. See AC 150/5220-22.

Appendix 2. RUNWAY END SITING REQUIREMENTS

1. PURPOSE. This appendix contains guidance on siting thresholds to meet approach obstacle clearance requirements and departure obstacle clearance requirements.

2. APPLICATION.

a. The threshold should be located at the beginning of the full-strength runway pavement or runway surface. However, displacement of the threshold may be required when an object that obstructs the airspace required for landing and/or departing airplanes is beyond the airport owner's power to remove, relocate, or lower. Thresholds may also be displaced for environmental considerations, such as noise abatement, or to provide the standard RSA and ROFA lengths.

b. When a hazard to air navigation exists, the amount of displacement of the threshold or reduction of the TORA should be based on the operational requirements of the most demanding airplanes. The standards in this appendix minimize the loss of operational use of the established runway and reflect the FAA policy of maximum utilization and retention of existing paved areas on airports.

c. Displacement of a threshold reduces the length of runway available for landings. Depending on the reason for displacement of the threshold, the portion of the runway behind a displaced threshold may be available for takeoffs in either direction and landings from the opposite direction. Refer to Appendix 14, Declared Distances, for additional information.

d. Where specifically noted, the glide path angle (GPA) and Threshold Crossing Height (TCH) of a vertically guided approach (Instrument Landing System (ILS), Microwave Landing System (MLS), Global Navigation Satellite System Landing System (GLS), Localizer Performance with Vertical Guidance (LPV), Lateral Navigation/Vertical Navigation (LNAV/VNAV), required navigation performance (RNP), or Barometric Vertical Navigation (Baro VNAV)) may be altered (usually increased) rather than displacing the threshold. Alternatively, a combination of threshold displacement and altering of the Glidepath Angle/Threshold Crossing H eight (GPA/TCH) may also be accomplished. Guidelines for maximum and minimum values of TCH and GPA are contained in FAA Order 8260.3, *United States Standard for Terminal Instrument Procedures (TERPS).* The tradeoff between threshold displacement, TCH, and GPA is complex, but can be analyzed by applying formula contained in the order. Contact the appropriate FAA Airports Regional or District Office for assistance on the specific requirements and effects of GPA and TCH changes.

e. The Glidepath Qualification Surface (GQS) extends from the runway threshold along the runway centerline extended to the departure altitude (DA) point. It limits the height of obstructions between DA and runway threshold (RWT). When obstructions exceed the height of the GQS, an approach procedure with positive vertical guidance (ILS, MLS, Transponder Landing System (TLS), GLS, VNAV, etc.) is not authorized. Further information can be found in the TERPS order, VOLUME 3.

3. LIMITATIONS.

a. These standards should not be interpreted as an FAA blanket endorsement of the alternative to displace or relocate a runway threshold. Threshold displacement or relocation should be undertaken only after a full evaluation reveals that displacement or relocation is the only practical alternative.

b. The standards in this appendix are not applicable for identifying objects affecting navigable airspace. See Title 14 Code of Federal Regulations Part 77, Objects Affecting Navigable Airspace.

4. EVALUATION CONSIDERATIONS.

a. Possible Actions. When a penetration to a surface defined in paragraph 5 exists, one or more of the following actions are required:

(1) Approach Surfaces.

(a) The object is removed or lowered to preclude penetration of applicable threshold siting surfaces;

(b) The threshold is displaced to preclude object penetration of applicable threshold siting surfaces, with a resulting shorter landing distance; or

(c) The GPA and/or TCH is/are modified, or a combination of threshold displacement and GPA/TCH increase is accomplished.

(d) Visibility minimums are raised.

(e) Night operations are prohibited unless the obstruction is lighted or an approved Visual Glide Slope Indicator (VGSI) is used.

(2) Departure Surfaces.

(a) The object is removed or lowered to preclude penetration of applicable siting surfaces;

(b) The Takeoff Distance Available (TODA) is decreased to preclude object penetration of applicable siting surfaces, with a resulting shorter takeoff distance (the Departure End of the Runway (DER) is coincident with the end of the TODA where a clearway is not in effect); or

(c) Instrument departure minimums are raised.

b. Relevant Factors for Evaluation.

(1) Types of airplanes that will use the runway and their performance characteristics.

(2) Operational disadvantages associated with accepting higher landing/ takeoff minimums.

(3) Cost of removing, relocating, or lowering the object.

(4) Effect of the reduced available landing/takeoff length when the runway is wet or icy.

(5) Cost of extending the runway if insufficient runway length would remain as a result of displacing the threshold. The environmental aspects of a runway extension need to also be evaluated under this consideration.

(6) Cost and feasibility of relocating visual and electronic approach aids, such as threshold lights, visual glide slope indicator, runway end identification lights, localizer, glide slope (to provide a threshold crossing height of not more than 60 feet (18 m)), approach lighting system, and runway markings.

(7) Effect of the threshold change on noise abatement.

5. APPROACH CLEARANCE REQUIREMENTS FOR CONVENTIONAL NAVAIDS. The standard shape, dimensions, and slope of the surface used for locating a threshold are dependent upon the type of aircraft operations currently conducted or forecasted, the landing visibility minimums desired, and the types of instrumentation available or planned for that runway end.

a. Instrument Approach Procedures Aligned with the Runway Centerline. Table A2-1 and Figure A2-1 describe the minimum clearance surfaces required for instrument approach procedures aligned with the runway centerline.

b. Nonprecision Approach Procedures Not Aligned with the Runway Centerline. To accommodate for offset procedures, increase the lateral width at threshold by multiplying the width specified in the appropriate paragraph by 2 (offset side only). The outside offset boundary splays from this point at an angle equal to the amount of angular divergence between the final approach course and runway centerline + 10 degrees. Extend the outside offset boundary out to the distance specified in the applicable paragraph and connect it to runway centerline with an arc of the same radius. On the side opposite the offset, construct the area aligned with runway centerline as indicated (non-offset side only). The surface slope is as specified in the applicable paragraph, according to Table A2-1.

c. Locating or Determining the DER. The standard shape, dimensions, and slope of the departure surface used for determining the DER, as defined in TERPS, is only dependent upon whether or not instrument departures are being used or planned for that runway end. See Table A2-1 and Figures A2-1 and A2-2 for dimensions.

Subparagraph 5c(2) applies only to runways supporting Air Carrier departures and is not to be considered a clearance surface.

(1) For Departure End of Runways Supporting All Instrument Operations.

(a) No object should penetrate a surface that starts at the DER. The surface starts at the elevation of the runway at the DER and slopes upward at a slope 40 (horizontal) to 1 (vertical). Penetrations by existing obstacles of 35 feet or less would not require TODA reduction or other mitigations found in paragraph 4; however, they may affect new or existing departure procedures.

(2) Departure Runway Ends Supporting Air Carrier Operations.

(a) Objects should be identified that penetrate a one-engine inoperative (OEI) obstacle identification surface (OIS) starting at the DER and at the elevation of the runway at that point, and slopes upward at a slope 62.5 (horizontal) to 1 (vertical). See figure A2-4.

Note: This surface is for provided for information only and does not take effect until January 1, 2008.

Table A2-1. Approach/Departure Requirements Table

	Runway Type	DIMENSIONAL STANDARDS* Feet					Slope
		A	B	C	D	E	
1	Approach end of runways expected to serve small airplanes with approach speeds less than 50 knots. (Visual runways only, day/night)	0	60	150	500	2,500	15:1
2	Approach end of runways expected to serve small airplanes with approach speeds of 50 knots or more. (Visual runways only, day/night)	0	125	350	2,250	2,750	20:1
3	Approach end of runways expected to serve large airplanes (Visual day/night); or instrument minimums ≥ 1 statute mile (day only).	0	200	500	1,500	8,500	20:1
4	Approach end of runways expected to support instrument night circling. [1]	200	200	1,700	10,000	0	20:1
5	Approach end of runways expected to support instrument straight in night operations, serving approach category A and B aircraft only. [1]	200	200	1,900	10,000 [2]	0	20:1
6	Approach end of runways expected to support instrument straight in night operations serving greater than approach category B aircraft. [1]	200	400	1,900	10,000 [2]	0	20:1
7	Approach end of runways expected to accommodate instrument approaches having visibility minimums ≥ 3/4 but < 1 statute mile, day or night.	200	400	1,900	10,000 [2]	0	20:1
8	Approach end of runways expected to accommodate instrument approaches having visibility minimums < 3/4 statute mile or precision approach (ILS, GLS, or MLS), day or night.	200	400	1,900	10,000 [2]	0	34:1
9	Approach runway ends having Category II approach minimums or greater.	The criteria are set forth in TERPS, Order 8260.3.					
10	Departure runway ends for all instrument operations	0 [5]	See Figure A2-3				40:1 [3]
11	Departure runway ends supporting Air Carrier operations. [4]	0 [5]	See Figure A2-4				62.5:1

* The letters are keyed to those shown in figure A2-1.

Notes:

1. Lighting of obstacle penetrations to this surface or the use of a VGSI, as defined by the TERPS order, may avoid displacing the threshold.
2. 10,000 feet is a nominal value for planning purposes. The actual length of these areas is dependent upon the visual descent point position of the instrument approach procedure.
3. ≤ 35-foot obstacles are permitted through the surface without requiring actions found in paragraph 4; however, they could have an impact on departure visibilities or departure procedures.
4. Information concerning penetrations to this surface is provided for information only and does not take effect until January 1, 2008.
5. Dimension A is measured from the departure end of the TODA as determined by the DER or clearway.

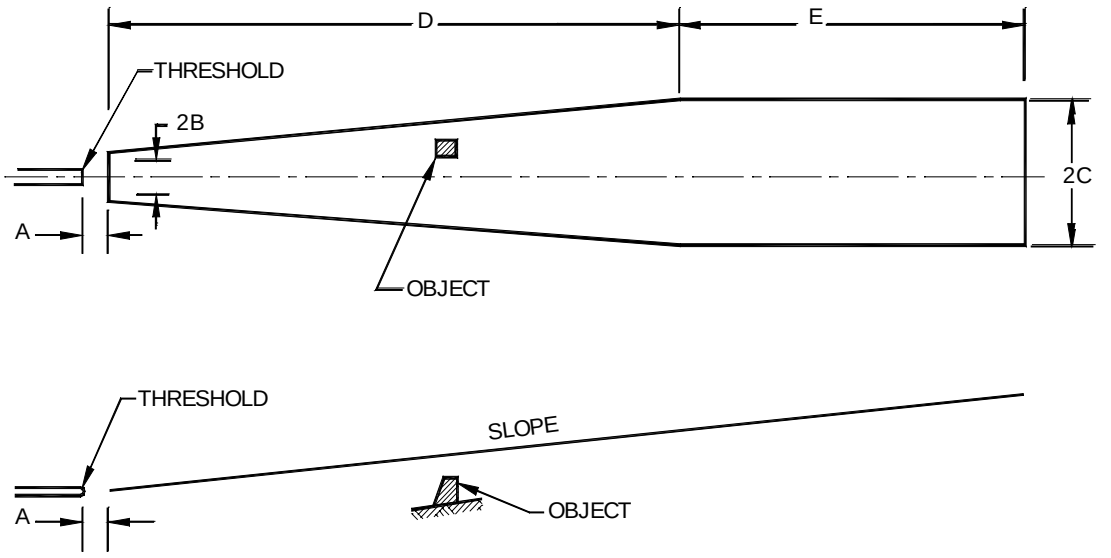

Figure A2-1. Approach slopes

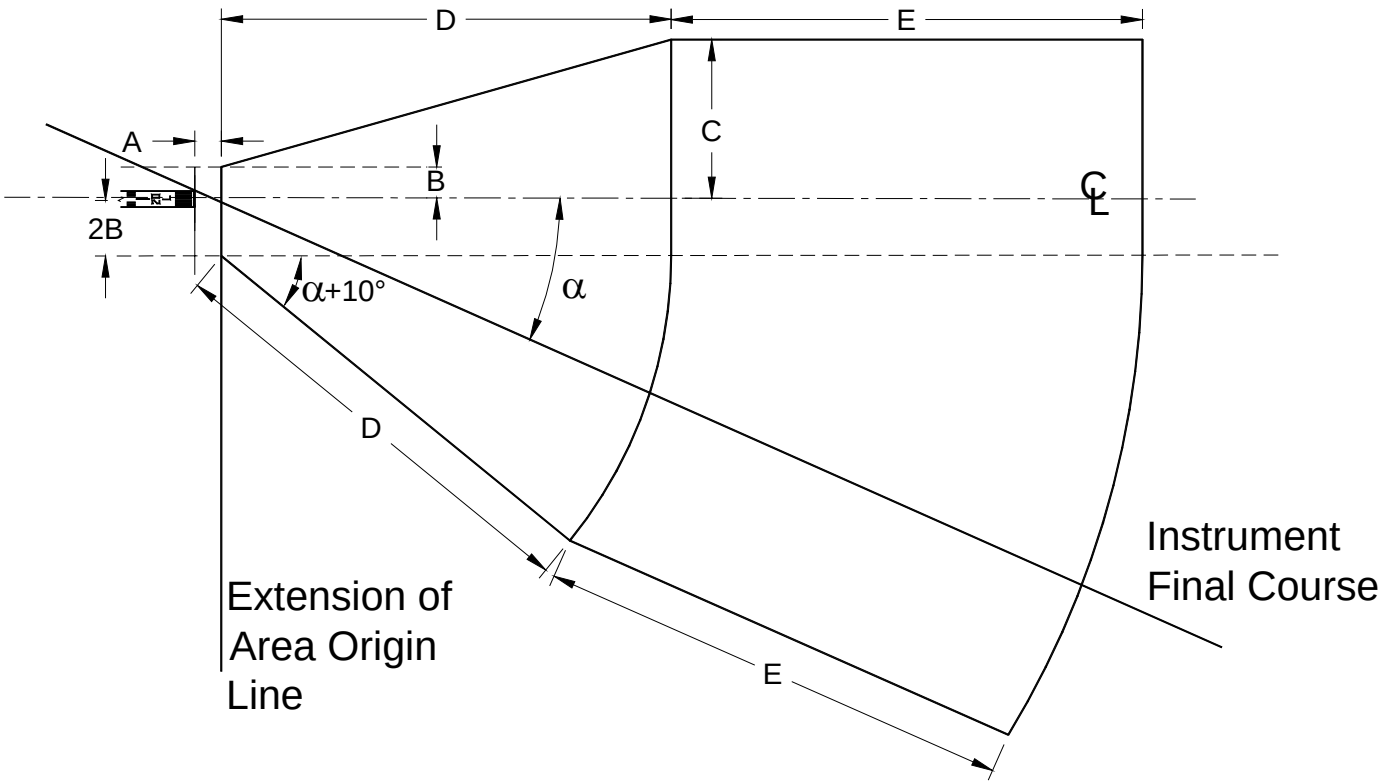

Figure A2-2. Approach Slopes—With Offset Approach Course

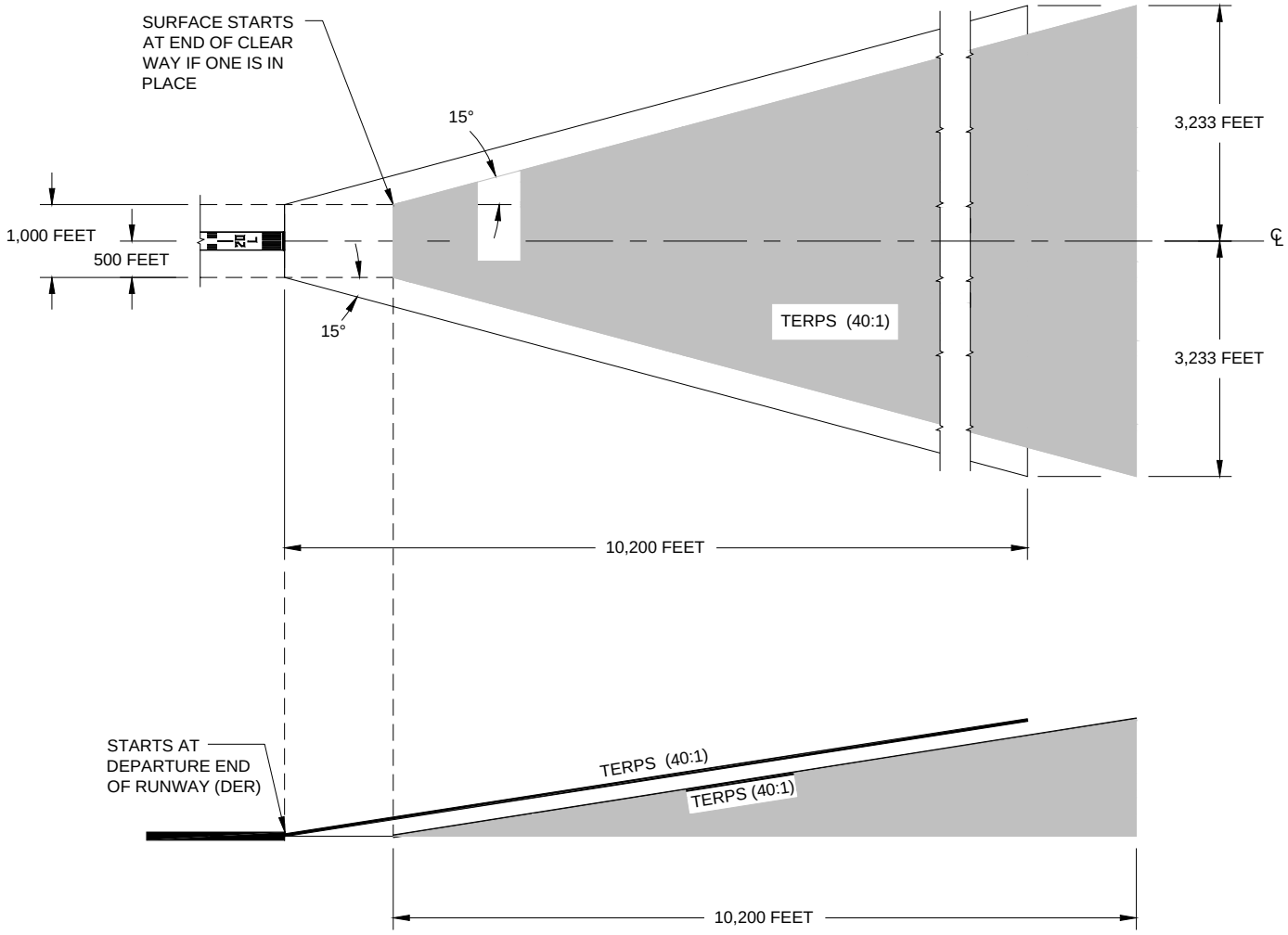

Figure A2-3. Departure surface for Instrument Runways TERPS (40:1)

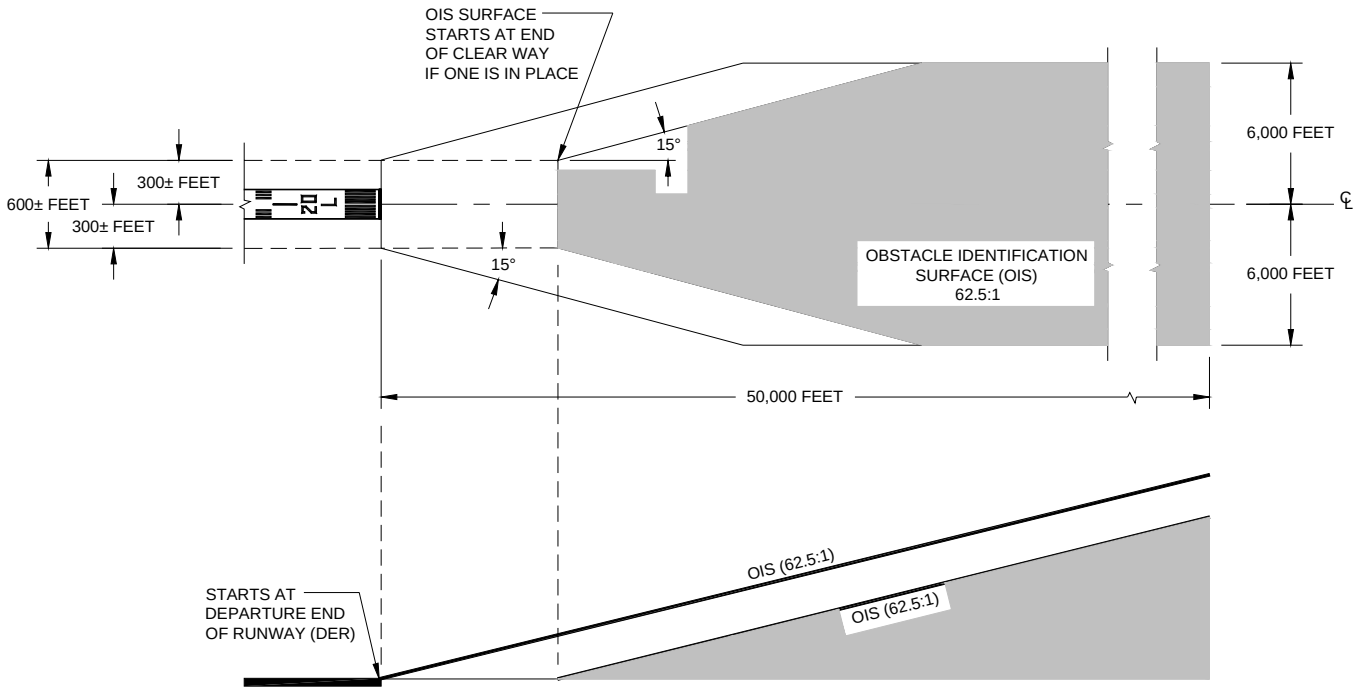

Figure A2-4. One-Engine Inoperative (OEI) Obstacle Identification Surface (62.5:1)